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ABSTRACT

The purpose of this manual is to help teachers and administrators develop a realistic plan for integrating microcomputers into the curriculum. It is based on the assumptions that (1) computers are a tool appropriate for every child, (2) teachers need additional training to use microcomputers effectively, (3) computer activities should be integrated throughout the program, and (4) priorities must be established for the use of a scarce resource. Some relevant concerns are first discussed, followed by a description of 15 curriculum development steps. Sample goals and objectives are then presented for such concerns as respect for others, development of individual potential, and effective learning habits; and for specific learning areas, including mathematics competence, writing, reading comprehension, problem solving, vocational competence, and artistic competence, as well as the interrelationship between technology and society, computer operation, and programing. Task force organizational issues and a teacher training sequence are given in the appendices. (MNS)

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Developing a Computer Curriculum

Inservice Series No. 17

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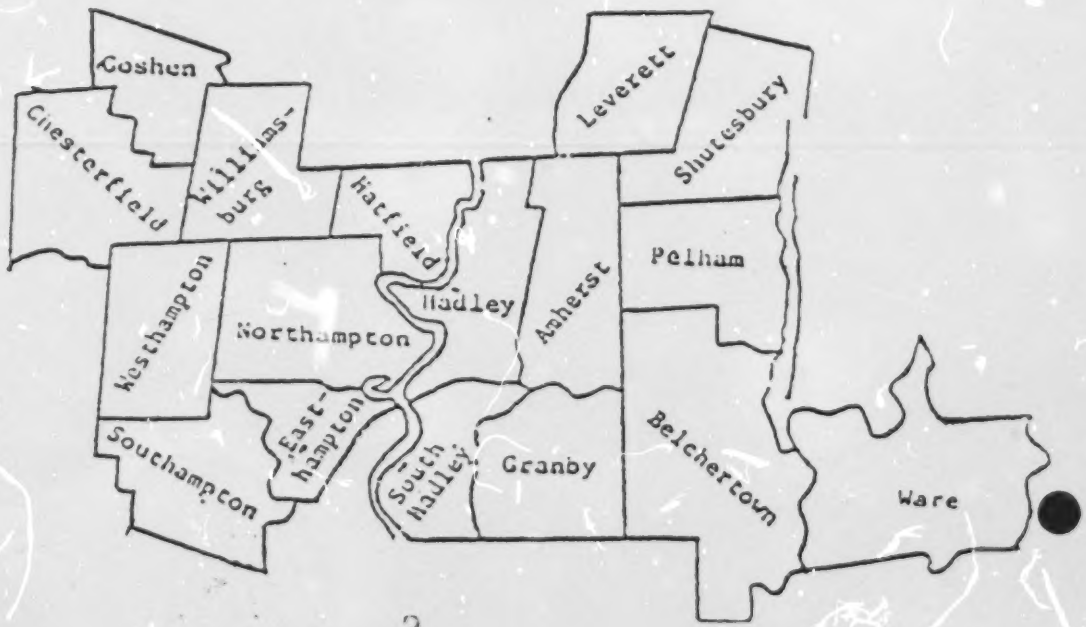

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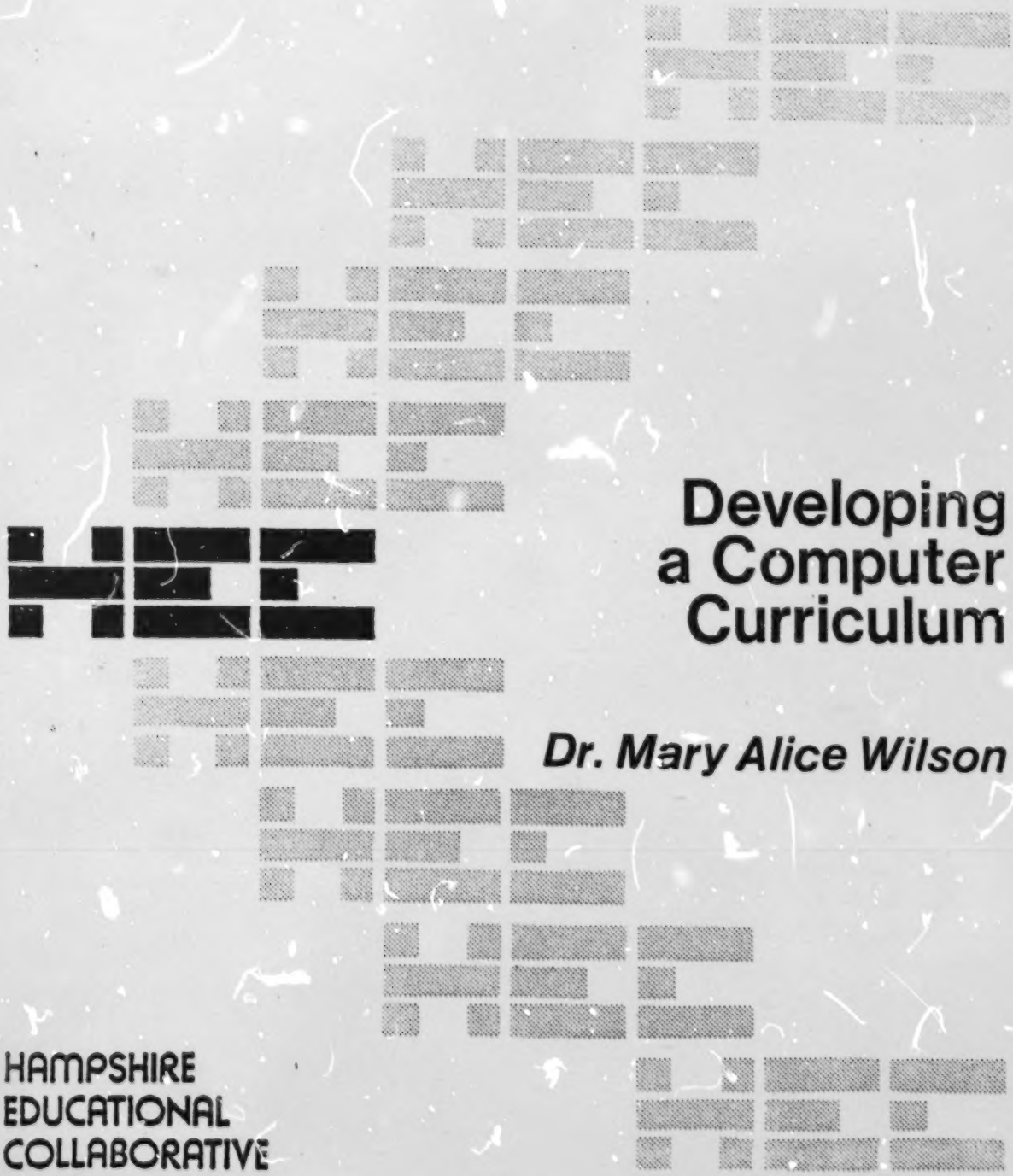

Developing a Computer Curriculum

Dr. Mary Alice Wilson

HAMPSHIRE
EDUCATIONAL
COLLABORATIVE

PREFACE

The purpose of this manual is to help teachers and administrators develop a realistic plan for integrating microcomputers into the curriculum. In my role as Supervisor of Computer Education at the Hampshire Educational Collaborative, I found I needed to have these materials together in one, fairly well-organized system.

The material you are about to use is like a quilt. For better or worse, it is more of a crazy quilt than a symetrical patchwork. The ideas incorporated in this material come from so many people it is almost impossible to list them. I do need to thank especially 3 authors whose writings and conversations have greatly influenced my thinking: Adeline Naiman, Michael Sherman and Gary Bitter. I would also like to Len Huber, Alan Lipp, Charlie Parham, Hy Edelstein, Beth Lowd, Susan Foote, Neil Davidson, Lamont Lyons and Ron Bell. The list is as endless as it is exciting for me to remember all the help I have been given.

This second draft is better than the first because of the spelling program Magic Word, because Alan Lipp helped with the math and computer objectives and because Neil Davidson, Sister Lorraine and Beth Wilson spent the time to read this manual carefully. The improvements are theirs; the remaining mistakes are, alas, my own.

I hope that changes in future drafts will be based on suggestions by manual users. Please let me know about errors, grammatical or philosophical.

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BEFORE YOU BEGIN

The purpose of this manual is to help a committee from a school system develop a computer education curriculum. The assumptions underlying this manual are that:

Computers are an educational tool appropriate to every child at every grade level for many types of activities.

Teachers will need additional training to use the microcomputer effectively in the classroom. The computer does not replace the teacher, Just the reverse: it places additional instructional responsibility on the teacher.

The goal of the computer curriculum should be to integrate computer activities throughout the school system so that every student will be able to use the microcomputer knowledgeably, imaginatively and effectively.

There will not be enough microcomputers to meet all students needs. Therefore, priorities will have to be established for the use of a scarce resource.

Before turning to the actual curriculum development process, there are eight issues you should consider.

1. PLANNING THE PLANNING PROCESS

Make sure the appropriate people are involved in curriculum planning process. Although school systems vary in their decision-making sequence, the computer curriculum development group should include FROM THE BEGINNING teachers representing each grade cluster and from both math/science and language arts/social studies interests. The group should also include: the administrators directly responsible for curriculum planning, a member of the library staff, a school committee representative, a teachers' union representative, a teacher of special populations, a parent and a student. If there are other groups in your school community who will provide ideas to the group and who should understand how decisions are made so that they can be supported later, include those people. It would be ideal if you could limit the working group to 10-12.

Ideally all members of the committee would have had some classroom or personal experience with microcomputers. If that is not possible, those without experience should visit some model programs in your area and should participate in a training program while serving on the committee.

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2. ORGANIZING THE MEETINGS

Spend time to make sure the planning group has a fair chance for success:

a. The group must have a chairperson and a record keeper Their responsibilities can either be rotating or permanent. For complete job descriptions, see Part IV.

b. Because of the number of drafts to be developed during this process (see Part II) there must be fast, accurate secretarial support for the committee. To make revision less burdensome, be sure the secretary is using a word processing program.

c. There must be comfortable meeting space (adult table and chairs) which is quiet (no intercom connection) and comfortable (coffee and tea, light snacks, warm in the winter).

d. There must be time to meet. Ideally, since this planning is a legitimate part of the professional responsibility of teachers and administrators, the meeting should be scheduled during school hours. If meetings are held on curriculum days, all teachers must be released to meet at the same time (there is often only a half-hour overlap between curriculum release time for secondary and elementary teachers). If meetings are to be held after school or in the evening, a strict time limit (2 1/2 hours) should be observed. Meetings should not be held more often than every two weeks. This is a semester's worth of work! The summer is another excellent work time if there are funds to pay teachers.

e. The group should meet as a whole to work on the first parts of the curriculum development process. It is only in the final stages (see Part II) that sub-groups by grade clusters should be formed.

3. AVOIDING QUASI-PHILOSOPHIC DISCUSSIONS

Don't waste time on the term Computer Literacy. This section is the only place in this manual where the word "literacy" will be used. There have been so many definitions and so much controversy that it seemed easier to avoid the term entirely. It should be noted however, that most of the controversy surrounding literacy has been caused by the fact that each proponent or opponent has used a different definition of the term.

At one end of this spectrum of definitions are people who list objectives which all begin with with such vague words as "recognize" "explain" or "be aware of"." Most educators find these verbs offensive. We know that the low level of understanding described by such terminology is the same as no understanding at all. At the other end of the spectrum are those

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who want everyone to program in at least two languages and use terms like serial interface and hexidecimal accurately and comfortably (not, by the way, an unreasonable assumption of any high school student capable of receiving a diploma).

If the group can assume a middle position (able to use computer as tool to do a task) the screaming will usually subside. Proponents of the extreme positions will not take meeting time defending their positions and will usually accept the necessity of "computer as a tool" for students for their academic, vocational and personal development.

Much time can also be saved by avoiding a long discussion about the distinction between the computer-as-teacher, as-tool and as-subject-to-be-learned. This division is a very handy method for categorizing the ways the computer is used: computer-as-a-teacher (drill and practice, tutorial, games, simulations), computer-as-a tool (applications programs such as word processing, electronic spread sheets, data bases, statistics, communications network) and computer-as-a-subject of study (programming, problem solving). The problem is that the discussion doesn't move the group any closer to a plan for the use of the computer in the school. On the contrary, it forces the members into choosing sides in a philosophic, and counterproductive, battle about learning, education and life.

However, since so much ink has already been spilled over this issue, you need to recognize when you have stepped into the quagmire:

a. <u>CAI: computer assisted instruction, or computer as teacher.</u> The purpose of CAI is to set up a problem for the student, check the answer, give feedback, be patient waiting for correct answer, and individualize pace. There are 3 versions: drill and practice designed for assisting students in achieving mastery in an area where the students already understand the concepts, tutorial designed to teach concepts as well as to provide practice, and curriculum oriented games designed to make drill more fun (shooting down the right answer). Simulations are also considered in the category of computer as teacher, but are not usually considered to be CAI.

b. <u>CAI vs. non-computer activities for skill development.</u> The argument is usually presented as, "The computer is motivating, will get reluctant learners to do dull work" vs." it is a very expensive electronic workbook, why are they doing boring work anyway?" There is no question that, given enough time and a proper program, students can improve scores on given skills. Yet, there are questions about whether they have improved their transferable skills or just their test taking abilities.

c. <u>Computer-as-teacher vs. computer-as-tool.</u> Drill and practice vs. problem solving. Computer in control of the learning environment vs. student in control. Most of those

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arguing for empowering the student (computer-as-tool) would agree that if the student is encouraged to analyze the skills needed, then selects, uses and evaluates a teaching program, then CAI has been used in an acceptable way.

d. Equity of access. Proponents argue that different groups in the educational community are using the computer in different ways, ways that exacerbate those differences, i.e. the gifted and talented children write programs; the Chapter I children do drill and practice; the special education children play games.

The task of your group will be to make sure that all groups in your school system have access to all uses of the microcomputer and, since microcomputer resources will always be limited, to establish priorities for the way those resources will be used to meet the goals of the school system. If you follow the steps recommended in Part II, these decisions should not tear your committee apart.

4. MODELING THE GOALS

Design a curriculum that assures the fulfillment of the goals you have selected. For better or worse, students learn more from the way they are taught than from what is said to them. It pays us to look carefully at the activities we are planning in order to meet the goals and objectives. Are we asking students to pass tests about computer ethics while illegally copying software for the classroom? How are we planning to reward group problem solving? Again, if you begin with the goals and work to the activities (see Part II), there should be no dissonance between goals and actions.

We know that learning occurs when a person has a deep, personal commitment to learn. We spend most of our classroom time trying to create environments that help develop that intense motivation. Computers are intrinsically motivating to most people. Our problem is to allow the learner to get access to the computer as a partner in the learning process: an equal partner, not a partner with all the right answers or one that is boring or too difficult to work with, but a truly well-matched partner for exploring and solving problems.

5. AVOIDING PRESENT HARDWARE LIMITATIONS

Try to avoid limiting your goals and objectives to your present hardware. That may sound unrealistic, but it will not be a useless exercise to have the group design the ideal curriculum. Then, if the curriculum needs to be cut back to match present equipment, the priorities will be more obvious. The alternative is to write up a one-page description of what is presently happening with computers in the school and submit that list as

your curriculum plan. (It certainly would be faster!)

6. USING COMPUTERS FOR ADMINISTRATIVE TASKS

Administrative use of microcomputers is not covered at all in this manual . There is no question that one of the most effective educational uses of the microcomputer would be to free teachers and administrators from some of the report preparation through word processing, databases, spreadsheets, report card, scheduling and accounting programs. Any long-range plan for computers in the school should include computers which are available exclusively to teachers and administrators for administrative functions.

7. SUPPORTING TEACHERS

The teacher training necessary for implementing the curriculum is not be covered in this manual. A brief description of a recommended Introduction To Microcomputer series is listed in Part V. We have found that all teachers and administrators need a generalized introductory training (either in a workshop series or in an individualized study program). After that 6-week introduction, teachers will need additional workshops in computer applications specific to their classrooms. Training must also continue for administrators who not only have their own administrative uses for microcomputers but who, as the instructional leaders of the school, must remain well-informed about the instructional capability of the microcomputer.

In addition to essential training, teachers must have access to microcomputers similar to those available to their students to plan activities. Computers should be available to teachers on a scheduled basis during preparation time, after school and to take home for weekends and vacations.

Resource people must also be available to the staff (either in the building or by phone) to answer questions, find resources, and recommend effective teaching strategies.

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CURRICULUM DEVELOPMENT STEPS

(If you have not read Part I, please do so now. The section assumes information contained in Part I.)

1. The computer curriculum must reflect and support the educational goals of the school system. Therefore, before you begin writing computer curriculum, dig out your school goals list. Have these goals duplicated for the first meeting. With these goals in front of everyone, skip to step #4.

2. If your school does not have a set of educational goals which the staff believes accurately reflects the purpose of the school (all secondary systems should have them as part of the accreditation process), then the curriculum development group will save itself time and energy if you stop now and establish a set of educational goals for your school (or school system). When you have developed a set of educational goals, skip to step #4.

3. If you agree with #2 (that setting goals for the school system is the first step) but are under pressure to produce a computer curriculum and/or can't force the goal setting issue, then refer to the curriculum objectives listed later this manual. Use those goals which you think match your school system's practices and beliefs. After the computer curriculum is complete, convince your school system to develop a set of general educational goals.

4. Put the educational goals along the top of a blackboard, or on the top of pieces of newsprint, make sure there is an empty column, or piece of newsprint, for "other". Brainstorm the objectives which might fit under each goal. Brainstorming is a serious activity designed to get the group to rapidly and creatively contribute ideas to the task at hand. Before beginning, the group should review the rules for brainstorming in Part IV of this manual. Brainstorm the computer objectives which might fit under each goal. Use your own ideas first, but after you have completed your list, check for additional goals in Part III of this manual. Don't force-fit goals, if you have objectives that don't fit easily under one of the goals, put them temporarily under "other."

5. When the group seems to have run out of new goals, focus on the "other" column. Cluster the objectives into similar groups and write summaries that seem to describe the purpose of each cluster. It may well be that the computer curriculum has goals beyond the core of general educational goals, so don't worry if you have a few left over. As long as the new goals aren't in conflict with the general goals, there should be no problem. If they are in conflict, stop now and make some serious decisions about which goals are more important to the group. So far the process may have taken you many meetings, however, if you have

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managed to get this far in one session, take a break. The group will run out of steam half way through the next activity if you continue.

6. You should now have a fairly messy list of educational goals with an unsorted list of possible computer objectives under each. Keeping all the lists still in front of you, go through each list, eliminating duplication, combining where appropriate, and removing any objectives that members of the group feel are inappropriate. Usually the goals that people object to are in the wrong column. This may be a time to open yet another "other" column.

7. Go through the lists once more trying to sequence, or at least cluster, the goals. You will need a labelling system, the easiest one will probably be: introductory, intermediate, advanced. Do not put grade levels on objectives. This is a fairly good place to break once again as the lists will need to be cleaned up before any additional work can be done on them. If the group is not using a word processing program to prepare the drafts, it loses 2 points.

8. The rest of the school system should receive a draft report at this point so that they (a) will not feel left out and react negatively later to your finished product and (b) make additional suggestions now about other areas that should be included. Make sure that your report is easy to understand and rewards feedback. Everyone who make comments on the draft and returns it to the building representative gets a disk or a free cup of coffee or a gold star, or at least a pat on the back.

9. Add the objectives suggested by the staff in their feedback. So far, the objectives have not been very concrete. As the group has been working, each person has had a personal vision of what will be happening in the classroom to achieve the objective. It is time to share those visions. This may be a fairly painful experience since secondary teachers tend to underestimate elementary students and elementary teachers do the reverse. It may also divide the computer-as-teacher from the computer-as-tool approaches. These differences are to be valued since different subject areas and different situations require different educational approaches. If you focus on putting multiple content areas and activities under the appropriate objectives, even if that means adding to the goal list, the differences should enhance the process rather than detract from it (see Part I).

The most appropriate process for this stage is probably brainstorming again. Taking each objective in turn, list context and activities that would meet that goal. Context is the language, the subject or the specific software that the student would be working with, i.e. "Using Logo...", "Given a writing assignment... ", "In a career exploration unit...", or "Given a

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business graphics program,.." Not all activities will be contex specific. There are often a number of contexts and activities that can be used to meet the same objective. At this stage all of these should be listed. Brainstorming must always end by cleaning up the lists, eliminating duplication, combining similar ones, and moving those that are on the wrong list to the right list. By the time that process is complete, the group should be ready to take a break.

10. Now comes the fun of choosing which of the contexts and activities are most appropriate to meet the objectives. One way to accomplish this is for the group to decide which activity (or activities) would be used to introduce the goal and which to reinforce it. Such a solution is entirely appropriate, especially since it focuses the entire group on the importance of having K-12 goals and objectives that are continually reinforced. Go through each list, labelling the objectives with I (introductory) and R (reinforce).

11. Again, send a draft out to all staff and ask for feedback. Add the information received to your list before you continue.

12. The next step is to turn the list into a plan which describes how that objectives will be met. If you have microcomputers at all levels of the school system, or at all the levels where you want them, this process will be difficult but not impossible. If you have not yet purchased the hardware, or have not yet even found the money to purchase the hardware, you can take one of two routes:

a. do an ideal plan first, then make a second plan of what can be accomplished with the present equipment;

b. do a plan for present equipment only.

If you like digging holes and pulling in the sod after yourself, take option b.

13. To make a final plan, you may want to use a chart similar to to the one on the next page. The problem with such a chart is that you may find the group getting too picky. It may be easier if you focus on a few grade levels (4th, 7th, 9th or whatever is most helpful for your system). Determine what you want students at these grades to be able to do. Work backwards from these grades. (If your school system uses a developmental level system rather than grade levels, you would, of course, modify the chart.)

The advantage of a chart is that it makes it easier to look at the entire system. When you have finished, summary charts can then be used for discussion with the entire faculty. Do not avoid filling out the faculty training column if the group is serious about implementing this curriculum.

14. The moment of truth is near. The group needs to review the entire plan to see if they can walk an individual student through it. Walk different students with different abilities and skills through the plan. Does each group have enough working time on the computer? Is there true equity of access? Walk teachers through the plan. Does each teacher have an opportunity to enhance the curriculum with the use of computers? Be a computer, are you in use all the time? Is there time for repairs? (Rule of thumb: assume that one out or every 20 computers will be down at any moment.) Is there time for individual projects, time for teachers to practice lessons before using them in class? Is there time wasted where the lab is locked and no one can use the computers? Finally, take one last look at the school goals. Will these activities really help achieve those goals. If not, seriously consider throwing away your work and starting again. If you have written the ideal plan and do not have the equipment to start it, you will want to have an immediate plan as well for your present equipment. It would be nice, of course, if the temporary plan lead logically into the long-range plan.

15. Congratulations. You have done it (almost). How are you going to know if your plan is working? What criteria are you going to use to revise it? Don't put this off, stay where you are and do its part. The best criteria for evaluation I have seen comes from Adeline Naiman's book, Microcomputers in Education: An Introduction (NEREX and TERC, 1982) pp. 42-43:

1. The school system itself judges the program to be successful, including the teachers, students, parents and the larger community.

2. Students are motivated to engage in computer activities even when not required.

3. Non-technical teachers and non-science/non-math teachers are excited about the use of computers and incorporate them into their classroom activities on a subject-related or non-formal basis.

4. Curriculum is modified to reflect the advantages offered by the new technology.

5. Teachers work together to institutionalize and expand the use of computer-related activities.

6. The system provides funds for acquisition for hardware and software, teacher training, curriculum revision, and hiring of specialists and/or consultants.

7. There is evidence of moderation in the use of computers- a balanced and appropriate use of the equipment and software is in evidence.

8. There exists a systemwide implementation plan for computers.

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Naiman's book expands on each of these criteria. These questions, along with other specific to your system could be used as the basis of an evaluation design.

Set up a timeline now for the times when data will be collected, who will do it, who will analyze and report on the data and to whom will they report. Some data will need to be collected regularly, some less frequently. Although it is not appropriate to judge the computer curriculum for its total effectiveness for a few years, it is very appropriate to judge the computer curriculum for its progress toward effectiveness each semester. Is this committee going to continue as the monitoring group? If not, who should?

Congratulations, you really have finished this time!

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type	level	activity	schedule	equipment	teacher training

PART III

SAMPLE SCHOOL GOALS, OBJECTIVES AND NOTES

(Randomly Arranged)

Respect for Others	13
Development of Individual Potential	15
Effective Learning Habits	16
Math Competence	17
Computer Operation	19
Writing Effectively	21
Reading Comprehension	24
Interrelationship Between Technology and Society	26
Problem Solving	28
Computer Programming	30
Vocational Competence	33
Artistic Competence	34

School Goal: RESPECT FOR OTHERS

Goals might include: The student will

a. practice/respect for others.

b. demonstrate openness to other students and awareness of their feelings.

c. accept others as members of different cultural, religious, ethnic or gender groups by accepting expressions of those differences: be they physical, intellectual, emotional or spiritual.

d. develop effective interpersonal skills.

e. participate effectively with others in joint tasks.

f. function productively and creatively in a multicultural, democratic society.

Objectives might include: The student will be able to:

a. help microcomputer partner with typing, planning, debugging, evaluating and revising projects.

b. help others in the class by posting well-documented programs for others to adapt.

c. help others in the class who are having computer problems by asking clarifying questions about goal, sequence, and commands.

d. build on ideas suggested by others to develop new programs.

e. respect the work of others by taking care of computer and disks and personal work habits.

f. keep journal of computer activities including reference to students who helped with idea, students who were helped.

g. evaluate software for stereotyping by ethnic heritage, sex, socio/economic, intellectual or physical capabilities.

Notes:

Microcomputers, because of the public nature of the work on the monitors, encourage students to work together to solve a problem and to share in the achieving of a common purpose. Some activities, like Logo, seem to work well with 3 students; some,

like word processing, work better with only 2 students. Activities that encourage students to work together and to build on each others ideas include:

a. scheduling 2 students per computers

b. asking for written descriptions of work which include the problem solving process: what we planned, what happened, what we want to try next time. (Also read section on problem-solving.)

c. encouraging students during class to help each other (not just with commands, but with ideas).

Respect for others' work includes respect for work on a disk. Many teachers allow students to look at the work of others, but discourage (forbid) them from changing that work in any way. Vandalism of work is considered the most serious of offenses (automatic flunk at secondary level; loss of computer privilege at elementary level). Although the easy way out of the problem of raiding private files is to have students responsible for their own disks, this avoids the issue and fails to reinforce appropriate behavior.

Discourage use of software, and/or the development of programs, which respond negatively to the user or which perpetuate stereotyping.

Encourage and reward sharing. Have students develop a card file (or electronic file) of programming ideas they have discovered that others might be interested in. They can develop tests of terminology, guessing games and treasure hunts around the computer skills they are learning. A simple database, like Notebook, can be used to keep an electronic classroom bulletin board.

If a school is going to practice what it preaches about respect for others, it will have to make sure that both the goals of its program and the daily practice of computer access provide true equity of access. Simple checks of the computer programming courses for the number of young women and minorities is appropriate, but not sufficient. Who is using the computer to program? Who is only using it as a patient but all-knowing teacher? What does that mean in the long-run about how each group views the computer, themselves, and their future interaction with the computer?

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School Goal: DEVELOPMENT OF INDIVIDUAL POTENTIAL

The goals might include: The student will

a. develop love of learning as life-long process

b. use knowledge and skills to adapt to changing world

c. explore range of communication modes including intellectual, artistic, kinesthetic and interpersonal

d. grow mentally, physically, morally and emotionally

e. develop a sense of personal worth and respect for others

f. participate energetically and joyfully in the creative process

---

Objectives could include. The student will be able to:

a. use computer for variety of verbal, mathematical and artistic purposes.

b. use the computer independently to extend understanding of concepts, improve skills and explore relationships between ideas.

c. use the computer cooperatively to extend understanding of concepts, to improve skills and to explore relationships between ideas.

c. postulate the ways that future computer technology could be used to enhance the student's future development.

d. integrate kinesthetic experiences and graphic opportunities on the computer.

(also see AESTHETIC COMPETENCY page)

Notes:

The relationship between body movement and computer graphics begins with the Logo activities of "playing turtle" and continues through animation and 3-dimensional rotation graphics. Other, relatively easily available activities, include the use of computer generated music for drama or dance, computer controlled light-boards for productions, or just simple computer graphic/ music presentations. Logo classroom activities can be combined with outdoor orienteering activities very effectively.

Computers are fun. A major responsibility of the computer curriculum is to help all students discover that.

School Goal: EFFECTIVE LEARNING HABITS

Goals could include: The student will:

a. manage time effectively by setting priorities, planning realistically and evaluating effectiveness of activities

b. use a variety of resources appropriate to the task

c. practice effective problem solving skills

d. practice effective stress management skills

e. practice neat work habits

The objectives could include: student will be able to

a. use the computer safely so that the equipment, the software, the student's work and the work of others is protected.

b. document ideas and maintain disks so that work and ideas can be found easily.

c. transfer procedural computer skills to non-electronic tasks (and transfer study skills learned elsewhere to computer activities.)

d. plan time effectively so that computer work can be saved, documentation developed and maintenance chores completed.

Notes:

Students will learn more about good work habits from the procedures they follow in the computer area than from any list they memorize. Not only does this mean that safe, effective procedures should be practiced as a pedagogical strategy, but there is probably no other way to survive the blizzard of disks, manuals, peripherals and paper.

Learning how to learn is one of the most commonly listed goals of educational institutions. The computers offer wonderful opportunities to experience, reflect on and practice those skills. There is no better teacher of careful work habits than a computer that has just faithfully followed a careless set of commands.

For more information on problem-solving skills, see that page.

MATH COMPETENCE

Goals might include, The student will

a. carry out computations accurately

b. interpret mathematical problems correctly

c. select appropriate methodology to solve mathematical problem

d. collect, analyze and report data

e. use mathematical terminology correctly

Objeccives might include, The student will be able to:

a. identify numbers by name and relative value

b. master rapid calculation skills appropriate to developmental level

c. draw and correctly label common polygons

d. select appropriate procedures and solve problems appropriate to developmental level

e. test solutions for reasonableness of result

f. graph mathematical relationships. Select type of graph which best displays the information

g. discover patterns in both geometric and arithmetic work

h. correctly sequence the steps in an algorithm

i. predict the result of varying a given aspect, value or variable in a situation

---

Notes:

Although there are many math drill and practice programs for introductory math concepts, Logo is still probably the best program to give students the opportunity to improve their appreciation of the relative size of numbers.

Calculation skills can be reinforced using drill and practice programs. Ideally, the student would write his/her own program using a simple Logo or BASIC program or an authoring language like Pilot. Almost any graphics programming will help students develop the calculation/application skills.

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Logo is famous for its use of geometry. Teachers do need to make sure that students learn the names for the shapes they are drawing. Paper and pencil and 3-dimensional activities will help reinforce geometry concepts taught on the computer.

Experiencing programming in either Logo or BASIC will help students understand the purpose and properties of variables. Although some schools make Algebra I a prerequisite for Computer Programming, the reverse sequence would certainly make Algebra easier and would not harm programming.

Logo's use of the full Cartesian graph can help students explore the meaning of the four quadrants. BASIC can be used to teach graphing, although the position of 0,0 in the northwest corner is annoying. Graphing programs such as Visiplot, pfs Graph, or similar business graphics programs can be very effective tools with junior or senior high school students to explore alternative strategies for displaying information. There are probably more interesting programs in graphing than any other software applications area.

Whatever type of approach you use to enhance the mathematics curriculum, check that the students are relating the concept learned to previous experience and are applying it to new learning. Check that they are using accurate terminology to explain the concepts. Make sure that they can transfer concepts learned to other situations and that they have not just learned how to take the test or answer the questions by rote but have really mastered the skill. Note: The problem of transfer is not unique to computers. In fact, it is the central concern of teachers at all times. However, computers have a tendency to lull the teacher (and student) into thinking that the learning has been successful and complete when it may have been successful in the narrow sense, but not yet complete (not integrated into the student's cognitive structure.)

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COMPUTER OPERATION

The goals could include, The student will

a. use the computer as an effective tool

b. operate a computer safely

c. understand how a computer functions

Objectives might include, The student will be able to:

a. demonstrate keyboarding skills to type "qwerty" keys

b. demonstrate ability to use function keys unique to the computer being used

c. use a microcomputer safely to load programs, work with the program, save and load files, print hardcopy, delete files, copy files, store disks, and stop programs in an emergency

d. select program or language appropriate for task by evaluating assumptions, limitations, and the potential of the program or language being used

e. demonstrate knowledge of major computer components, functions and terminology (by correct daily use, by designing "The Ideal Computer" or participating in role-playing of computer functioning)

f. use common, computer related terms accurately

g. demonstrate knowledge of the relationship between computer and languages by designing new functions for the computer and developing languages to help computer do the task

---

Notes:

Languages are the ideal way to learn the essential computer commands. Logo or BASIC allow students to load, write, save, recall, catalog, list, print and handle the computer and disks safely. There are programs specifically designed to introduce computer operation at present these are rarely good, the are flashy and, since they offer no concrete reason for following the procedures, students do not remember, or follow, the instructions. Presumably these programs will improve.

All activities with the computer: the way the teacher uses the computers, the way the room is organized, the way students are

rewarded for safe use, the way disasters are analyzed, in short, all computer activities should reinforce the safe, effective use of the computer. As always, the burden is on teachers to practice what we preach.

If more than one type of computer is available, students can learn to recognize the common elements in computers. Advertisements can be used to identify common elements. Students can be asked to design (and write advertisements for) the Perfect Computer. The class could set up minimal specifications for the project. Even selecting a name will require scanning journals to make sure the name is not already in use.

Since students learn more from acting as teachers than from acting as students, older or more experienced students can be used as instructional aids in classes for other students or for the adult community.

Vocabulary is always best taught through experience. Using terminology correctly is important. Lecturing about it is a waste of time; reinforcing the correct meaning of terminology after students have had experience to understand the vocabulary is essential.

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WRITE EFFECTIVELY

Goals might include, The student will:

a. express himself/herself adequately in writing

b. understand and apply the principals of usage in written communication

c. organize research problem, collect and analyze information and report effectively

d. write with unity, coherence and balance

e. achieve satisfaction through written self-expression

f. use problem-solving strategies to develop effective written communications

---

The objectives might include, The student will be able to:

a. use a word processing program successfully to write text: load the program, type, correct, move blocks of text, replace, save, print, edit hardcopy, load, re-edit

b. use a word processing program in cooperation with other students to produce finished projects for distribution

c. use the word processing approach (editing and terminology) while working on non-electronic writing project

d. chose writing tasks which would be most appropriately performed using a word processing program

e. evaluate word processing programs for ease of command, eye strain, scope of commands

f. evaluate electronic editing programs for editing assumptions

g. use the programming analogy of sequence of commands (writing for a specific audience) and debugging (editing) when editing text

h. investigate and report on the use of electronic writing outside the classroom situation

i. use a classroom electronic bulletin board to communicate with classmates and teacher

---

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Notes:

Word processing programs offer the most obvious microcomputer application for the author. If drafts are produced on the computer and edited by the writer, peers and/or teacher, the editing process can be relatively easy and, at the same time, very exciting. To use word processing programs effectively students need to know how to

a. use the "qwerty" keyboard efficiently
b. operate the computer safely
c. proof read
d. edit their own work and that of others
e. use the common commands in the word processing program

Keyboarding can be taught off the computer using old typewriters and a self-help manual. Primary students can be introduced to keyboarding, but most probably cannot master it. At the upper elementary level, a keyboarding learning center can be organized. Passing a low-level typing test could even be a pre-requisite for using the computer. (Such a test would not apply to those students with limited motor skills for whom even a one-finger use of the keyboard can be powerful skill.)

Computer operation skills are better taught in a language (Logo or BASIC) than in a word processing program. Word processing can reinforce some computer operation skills, but word processing does not lend itself well to teaching the operations (it is difficult to separate the computer commands from the software commands).

Which software? Many of the new word processing programs have good manuals, some have tutorial disks or tutorial cassettes. When students are introduced to the word processing commands, they usually do better writing their own words and being helped to use the commands than if they are given bogus text to correct. (Very few of us need help making mistakes; it is one of the things we do well.)

Time on the computer. Word processing is time consuming. Students need 20-30 minute blocks of time in reasonably good writing situations (quiet, stimulating). If students do a draft and a final copy, they need twice as much time. Although there does not need to be a printer attached to each microcomputer, students will need access to a printer.

It is probably not practical for every student to write every paper using a word processor. A more reasonable goal is to have every student in an English or Social Studies class use a word processing program at least once during the semester for a paper. With each assignment, 5 students would be assigned to use the word processor. They would have a deadline for the draft version and would be expected to submit a second, shorter paper on the

process of using the word processor. Class discussions should include strategies for using the kinds of commands available in electronic writing (moving blocks of text, changing sequences, searching for over-used words).

Editing software: there are electronic editing programs available for most of the more powerful word processing programs. Older students should have the opportunity to try these programs and to examine the assumptions behind them. On simpler programs the Replace command can be used to search for mis-spellings, over-used words, or commonly mis-used phrasing. One program not yet on the market (Quill), offers the opportunity for students to turn paragraphs into a set of sentences to examine structural patterns.

Programming as a writing metaphor. The computer, after all, is the audience for which the programmer is writing. The de-bugging process is really the editing process. Although this metaphor can be carried too far, students who have done programming, but are impatient with the writing process, may find the analogy helpful. Certainly, anyone who has programmed knows that proof reading skills are honed by the process.

Writing activities can be done using PRINT Statements (either in Logo or in BASIC). Teachers have reported that some students will write poetry on the computer using PRINT statements who would baulk at putting pen to paper to write a poem.

The problem solving skills developed with the computer can also be transferred to writing. The Acton Schools BASIC CHALLENGES In Problem Solving materials list the communication steps as: identify the audience, know your purpose, decide on the main points, check the details, choose a good form, look at the words and style, and test the communication (see the page on Problem Solving for a bibliographic reference).

There are drill and practice programs available grammar and spelling. The issue with these programs is not whether they are better or worse than non-electronic drill and practice in spelling or grammar but whether that type of activity, electronic or not, improves writing.

Papers can be assigned on computer-related topics: making up ad copy for a computer the class invents, interviewing and reporting on jobs which are influenced by computers, writing research papers of people or events related to the development of computer technology or social effects. Students will obviously enjoy and benefit more from such research if they have had personal experience using a computer.

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READING COMPREHENSION

The goals may include, The student will

a. read and comprehend materials appropriate to age and experience

b. select and use reference materials appropriate to the task

c. enjoy reading

Objectives: Student will be able to

a. accurately interpret sequence of directions presented in a computer program

b. locate appropriate information in a manual to use a computer program effectively

c. investigate and report on information from books and periodicals about computer related topics

d. use and evaluate (or design and evaluate) drill and practice programs appropriate to reading skills the student needs to develop

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Notes:

Letter recognition: There are a number of simple programs which show a letter or a picture when a key is pressed and can be used with children who do not recognize the capital letters. There are no lower case keyboards (although adaptations could be made). These programs can be purchased or written by older children in Logo or BASIC.

Almost all programs require reading screen directions. The complexity of the directions vary with the program. There are also manuals, but experiments have shown that students will not turn to manuals even when using arcade games where manuals would enhance the play considerably. Therefore, any use of the manuals will have to be encouraged and lavishly rewarded. Programs to improve reading should be chosen carefully since many of the screen formats are confusing.

There is a flood of adult and student periodicals about computers. Students can be assigned readings, asked to clip and review newspaper articles or advertisements for bulletin boards and research reports, the potential is infinite.

There are drill and practice programs related to reading skills. Assuming (a) the student has enough background to use the

program effectively to move toward mastery and (b) has enough time on task to make a difference, these programs can improve test scores. (Keep track of whether the skill is actually practiced later, i.e. the effectiveness of the skill transfer.) Students can write their own programs using Logo, BASIC, or SuperPilot. They will learn 90% of the skills just deciding how to design the program.

School Goals: INTERRELATIONSHIP OF TECHNOLOGY AND SOCIETY

Goals could include: The student will

a. understand the relationship between technology, environment and society

b. trace the impact of change on political, economic and social institutions

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Objectives could include: The student will be able to

a. research and report on the personal impact of computers for people of different age, educational, socio/economic background and culture

b. predict future effects on computer technology on different groups in our society

c. demonstrate ways the computer is used for different applications (scientific research, accounting, data processing, writing and simulations)

d. prepare and practice a personal statement on the ethical use of computer software

e. develop a database to investigate the controversy surrounding the use of databanks and individual privacy

---

Notes:

The history of computers is much better taught as part of the the study of the impact of computers in society, than as part of a programming course. In the development of computer education, the history of computing was always the first unit in college programing course because the instructor did not have a computer lab and had to say something during the scheduled lectures while the University students were struggling to learn how to signed on and off the terminals. When these students became teachers, they automatically started their course the same way even when they had a lab full of microcomputers and eager students. The historical significance of computers can only be understood after students have had some experience on the computer.

If you are presenting a unit on the history of computing, beware of the cultural bias of treating the abacus as a primitive old-fashioned calculating tool. One fifth of the world's population still uses the abacus (which is a base-5 system) effectively today.

Research on the impact of computers can be done by students of all ages: scrapbooks of pictures and articles, interviews and research on applications. There are an infinite number of topics for social studies (influences in jobs, trade, politics, military, transportation etc) and language arts (papers, presentations, debates, advertisements for class-created technological advances) The use of computers would be a wonderful topic for a unit on oral history, or on interviewing techniques.

Research on who is using computer where in our society and in other cultures could be followed by student predictions of how this will effect children from different cultures.

Issues related to computer abuse and equity of distribution of the technology lends itself well to Kohlberg style dilemmas, discussions or personal statements.

Again, it is important to practice what we preach. We cannot ask students to practice ethical use of computer software if we do not do so ourselves.

Databanks are all around us. One way for middle school students to understand the significance of the privacy issue would be to have them develop a simple databank. For example, students could design a database to determine credit rating. Once the categories were chosen and the format entered, students could put in some imaginary people and use standard database commands to work with the data. What happens to a person if information is incorrect? The next step would be to collect some credit application forms to see what questions are actually asked and to explore the reasons for the ones not included. Older students can look at the assumptions behind some of the questions.

School Goals: PROBLEM SOLVING

Goals could include: The student will

a. use procedural thinking (experience, intuition, and theory) to study a problem

b. use inductive, deductive and intuitive reasoning effectively

c. respond flexibly and creatively to a problem by finding similarities and differences, synthesizing and inventing solutions

d. develop accurate, sequential procedures to accomplish tasks

e. use problem solving skills (identifying problem, setting goal, brainstorming, selecting alternatives, organizing, testing and evaluating)

The objectives might include: The student will be able to:

a. document problem solving process (ideas, strategies, results, changes and evaluations) in developing programs or using software for a complex task

b. use brainstorming to search for alternative strategies to a programming task

c. maintain a microcomputer journal in a problem-solving format

d. transfer procedures used in programming to non-electronic tasks

e. use and evaluate software designed to improve logical thinking for effectiveness in improving skills

f. use and evaluate simulations for assumptions and limitations used by the programmers

---

Notes:

The importance of developing problem solving skills is often mentioned, but rarely defined, practiced or evaluated. Papert (one of the developers of Logo and a prolific writer on Logo and problem solving) suggests the following steps: formulate project, make precise plan, split tasks into parts, get solution, try again.

Logical thinking games can be used to help students develop specific sub-sets of problem solving skills. Some of these games are electronic versions of board games, which although sometimes temporarily more interesting on the computer, are still very worthwhile in their non-electronic form. According to Malone, in the April 1983 Classroom Computer News, for a game to be effective it must be challenging (outcome is uncertain but not baffling), enticing (allowing a person to enter special environment with special rules or symbols or relationships) and exciting (element of anticipation and surprise). Games are boring because they are either too easy or too difficult to meet Malone's criteria.

Logo and BASIC solve problems differently (although Structured BASIC is somewhat closer to Logo). Logo's "mind sized pieces" or procedures which can be combined into more complex procedures may be a first language for students than BASIC. Some interesting work is being done at the college level to teach problem solving in a language-free environment before introducing any computer language. Karel the Robot is an especially fine example of a text which introduces students to programming strategies (and Pascal). Younger students, however, may learn better from concrete experiences with languages first. This is certainly a fruitful area for research.

Simulations provide an environment in which to investigate relationships. In computer simulations, the computer helps with calculations and produces random number generation. The real power of simulations is to allow students to explore the limitations and assumptions of the simulation maker.

Four useful references are:

BASIC CHALLENGES In Problem Solving, Acton Public Schools, Acton MA. An E.S.E.A.Title IVC Demonstration Project. These excellent training materials for teachers and students in the problem solving process are available for both elementary and secondary students.

Hofstadter, D. GODEL, ESCHER, BACH: AN ETERNAL GOLDEN BRAID, Vintage, 1979.

Papert, S. MINDSTORMS: CHILDREN, COMPUTERS AND POWERFUL IDEAS, Basic Books, 1980

Pattis, R. KAREL THE ROBOT: A GENTLE INTRODUCTION TO THE ART OF PROGRAMMING WITH PASCAL, Wiley, 1981

School Goal: COMPUTER PROGRAMMING

Goals might include: The student will

a. correctly interpret the commands in a computer program

b. select language and commands appropriate to accomplish the task

c. design, test, refine and document a computer program

d. use, evaluate and revise a computer program

e. design a computer program using symbolic coding (flow charts, pseudocode)

f. evaluate program for its success at meeting the goal

Objectives might include: Student will be able to

a. write a program or procedure to accomplish task

b. document program so that others can understand the logic

c. select commands and programming strategies appropriate to the task

d. successfully modify existing program to meet new need

e. use variety of strategies to successfully debug program

f. prepare programs which are interactive and which use graphics, random number generation and mathematical manipulation

g. prepare a teaching program to help another student learn a concept or practice a skill

h. test program for reliability of results

i. use graphic representations of programming process to document programs and to plan programs

j. predict consequences of sequence of commands, test the program and evaluate prediction

k. select best of a number of correct solutions to a programming problem and explain criteria for selection

l. use computer terminology correctly

Notes:

Programming bugs are not bad. Not even half-bad. Students must be encouraged to always be searching for alternative ways of accomplishing a programming task. A program which runs is simply one in which the potential for debugging is greater. Students should learn to evaluate programs, searching for the cleanest way to accomplish a task. Alternative approaches should always be considered.

Teachers should try to avoid teaching introductory or intermediate students shortcuts which work only on certain brand of computers and mask the generic quality of the command. (Students will, of course, discover the shortcuts on their own.)

Flowcharting or pseudocode are really better designed for BASIC, than for Logo. (It cannot be used with Pascal.) There are ways to graphically represent levels of procedures in Logo, but they are not standardized. Once students know how to program, they can understand the flowcharting symbols (not the reverse)! Flowcharting or pseudo-code can be used in non-computer projects: planning a field trip, describing a strategy in a team sport, or planning a research project.

Structured BASIC, which breaks the task down into a series of sub-programs or units is much closer to Logo than the original flowcharting model of Fortran. Make sure the graphics you use accurately reflect the approach you want the student to take.

Having students of any age keep a journal is an excellent way to encourage documentation of both program and ideas. One simple structure for the journal pages might be:

Plan Predicted Result Commands Results Changes New Ideas

A journal, or notebook, will help students gain some historical perspective on their own development. If you are encouraging the development of reflective understanding of the learning process, grading these journals for being up-to-date and complete is perhaps more important than grading the programs themselves.

It is important to present programming as a logical sequence of commands, not as a way to solve mathematical problems. The mathematicians will find ways to use programming for themselves; the teacher's responsibility is to make sure that those who are not interested or skilled in math learn the joy and power of programming. For example, you can teach all the branching commands in BASIC using only the PRINT statement.

A reasonable sequence in Logo might be:

direct graphics commands (RT,LT,FD,BK,PU,PD,ST,HT,HOME,DRAW, REPEAT, and colors if available)
procedures (first and second level)
variables
recursions, if
list processing, random numbers
numeric commands
graphing (SETX, SETY,SETH)
input

A similar set for BASIC would be

programming: line numbers, PRINT literals, GOTO, REM
interactive programming: INPUT, string and numeric variable, IF
graphics: lores, hires, iteration, FOR..NEXT, random numbers
data use: READ..DATA, sequence of mathematical operations
subroutines and music
string variable manipulation
arrays
files

The issue of BASIC vs. Pascal needs to be explored. At least read the Teacher's Manual for the Advanced Placement Test in Computer Programming (available for $5.00 for Advanced Placement, Princeton, New Jersey) before you make a decision. Even if you are not at all interested in offering an advanced course, the manual makes an almost poetic case for Pascal and has an excellent bibliography.

School goal: VOCATIONAL COMPETENCY

The goals might include: The student will

a. demonstrate good work habits, a positive attitude and ethical values

b. demonstrate skills and attitude necessary for placement in entry level jobs

---

Objectives might include: Student will be able to

a. use Applications Programs commonly found in modern business situations (word processing, databased management, measurement devices, cash registers)

b. investigate and report on the use of computers technology in the student's area of vocational interest

c. predict changing job market based on research on the effects of the technological revolution

d. practice safe work habits which protect one's own work, the work of others and help maintain the computers and software

e. contribute ideas and debugging suggestions to the classmates

f. intern in a workplace, keeping a record of academic, technical and interpersonal skills needed

---

Notes:

Although it is certainly true that job skills are changing rapidly, human relations skills are still an important part of any vocational training program. Data on effectiveness in the workplace demonstrates that most people who are fired loose their jobs because of inability to get along with others rather than lack of technical skills. Therefore, teachers should model and reward behaviors which contribute to the collegial environment of the classroom.

Since the technology of the workplace is changing so rapidly, students need the opportunity to learn about learning, to understand how to master new materials, relate it to past information, decide sequence needed for effective learning. This mastery of the learning process must be a major component of any vocational training program.

School Goal: ARTISTIC COMPETENCE

Goals might include: the student will

a. develop aesthetic tastes, values, skills

b. experiment with wide range of artistic expression

c. become skilled artisan, performer or creator

d. recognize and value personal talents

e. value the artistic expression of others

f. express feelings and ideas through art

Objectives: Student will be able to

a. use program and software to create visual materials

b. evaluate electronically created visual presentations for aesthetic value

c. use programming and software to create musical presentations

d. use programming and software to create animation

(see page on Individual Potential)

Notes:

The computer should not be considered as a replacement for older forms of graphic and musical expression. This are still a vital part of the experience of all young people. The computer simply offers an additional medium to be explored.

At the lowest level, students are subjected to so much electronic graphics and music, they should understand how it is being produced by producing some of their own. At a less consumer-oriented level, the computer offers fascinating graphic and music capabilities. Some computers will need additional sound peripherals to produce more than single beeps. Such components are not expensive.

APPENDIX A

CURRUCULUM TASK FORCE: ORGANIZATIONAL ISSUES

Agenda Planning

Note Taking

Team Roles

- Facilitator
- Assistant Facilitator
- Recorder
- Liaison

Problem Solving

- Setting Goals
- Force Field Analysis
- Setting Realistic Goals
- Time Line
- Defining a Specific Problem
- Generating Possible Solutions
- Evaluating and Testing Solutions
- Deciding on the Best Solution
- Settling Details of Implementation

CURRICULUM TASK FORCE: ORGANIZATIONAL ISSUES

(the following material is excerpted from Wilson, Helping Teachers Become Inservice Facilitators HEC Inservice Series #6)

The task force members must function as a well organized team. In order to do that, they need to:

plan meetings effectively

keep and use meeting notes

run meetings effectively

communicate information to and from staff not on team

practice effective problem solving skills

Agenda Planning

Good meetings don't just happen. They are planned. Ideally, they are planned and the agenda is drafted at the end of the previous meeting. The agenda planning form (#1 at the end of this section) can be very helpful to the planner. Agenda should always be distributed before a meeting to remind people of the purpose of the meeting and to allow them to make any plans or bring any materials which would assist the meeting. The person responsible for running the next meeting is responsible for the agenda (see roles below).

Note Taking

Useful notes are essential to the success of the group. Use a note-taking form (#2 at the end of this section) to keep the process simple and legible. If this form is used, notes can be photocopied and distributed the day after the meeting. The notetaker (see roles below) is responsible for taking, distributing, and keeping a file copy of the notes. Copies should also be sent to selected administrators and teachers who need to be kept informed but do not serve on the committee.

Team roles

These roles can either be rotated or permanent. There are arguments for permanency (everyone remembers what they are doing and who should be contacted about what) and for rotating

(ownership of the whole process is greater, no one style predominates, hidden talent is discovered, burden shared). My recommendation is to try rotating, if it is absolutely impossible after 3 months, go to permanent.

Facilitator: Plans agenda (hopefully at the end of the previous meeting so everyone can give ideas). Distributes agenda a week before the meeting. Starts meeting ON TIME. Sets procedures and time limits. Helps all members participate in the meeting. Calls for breaks. Reviews decisions made. Saves last 10 minutes of meeting to review and plan. Ends meeting ON TIME.

Assistant Facilitator: Helps plan agenda. Keeps track of time, checks that all members are involved. Acts as recorder of visible notes (blackboard or newsprint) when needed. Leads evaluation of meeting and planning for next time. Compiles written evaluation of the meeting. Distributes evaluation summaries to all members within a week of the meeting and becomes the facilitator for the next meeting. (Evaluation form can be simple: What was the most helpful part of this meeting? What was the least helpful part? Next time, we need to..., #3 at the end of this section.)

Recorder: Keeps written record of decisions, actions, responsibilities of members and deadlines (see form at the end of this section). Checks with the group during the meeting to make sure of relevant information. Takes notes focusing on accuracy, simplicity and legibility. Uses black ink for easy photocopying later. Photocopies minutes after the meeting and distributes the next day. Becomes assistant facilitator at the next meeting.

Liaison: Each member of the task force was selected in part because of his/her constituency. In order for the group to continue to function effectively, this constituency needs to be kept informed and needs to be encouraged to make suggestions. The group will need to decide:

a. strategies for providing regular information

b. if there are any groups not covered

Strategies can include: taking five minutes to report at each faculty meeting, distributing the notes to everyone, posting a copy of the notes next to the coffee pot with a place for suggestions, putting condensed notes on the attendance bulletin, making an intercom announcement, having a few minutes on the department or grade level meeting agenda, checking personally with every staff member, all of the above.

There needs to be open and regular discussion about roles, discussion about the techniques which work, specific compliments when people do a job well, suggestions when they are having trouble. (For strategies to work with the really angry and

intentionally or unintentionally disruptive team members, see the Facilitator Manual, Chapter X.

Problem Solving

1. Setting goals:

The first attempt at setting goals can be fairly crude, "We want a computer curriculum". It is better to have the goal too broad than to have it too narrow.

2. Force Field Analysis:

With that general goal written at the top of the board (newsprint), begin looking at the forces that are impeding the goal and those that are assisting the goal. This technique, called Force Field Analysis, helps the members share their anger, dispair and optimism and provides a way to look realistically at the task at hand. The group need not agree about the intensity, or even direction of a force. Some may see the administration as supportive, others as unsupportive. Put arrows in both directions. An example might be:

Goal:Develop a computer curriculum

Forces against Forces for

<---------- money for hardware

organization of this committee------->

<----------time for committee to meet

<------administrative commitment to project---->

There is a form (#4) at the end of this section.

3. Setting realistic goals:

Having looked at the overall issue, the committee should set more realistic goals (Section II of this manual suggests some, but there may be others the committee will want to include). The committee will probably have 3-5 goals. When they are listed, the committee needs to define them more specifically by looking at what success really looks like: What is the lowest level of success that I, as a committee member, could live with (pessimistic level)? What do I expect (realistic level)? What

would make me very happy (optimistic level)? See form at the end of this section. (#5)

The group may not be able to reach consensus on all of these levels of success. This is a situation where it is all right to leave a disagreement, simply record that difference. However, without sharing this realistic appraisal before the group begins, there simply won't be a good feeling at the end. Some members will be elated that so much was accomplished, others depressed that more wasn't achieved.

4.Time line:

One final planning piece, setting some deadlines. Which pieces need to come first, what are the critical dates (budget hearings, contract negotiations? Are there any non-negotiable dates when preliminary reports are due)? Which pieces need to be tackled first (Section II suggests the order of these, but your committee will want to make sure it agrees or replaces that sequence with another). It is not critical that every step be worked out now, but it would be disastrous if the group broke into subcommittees that were working simultaneously only to find that they needed information from each other before they could get anything done or they were working very hard doing the same thing, or they were working very hard doing such different things that 3/4 of the work had to be discarded.

5. Defining a specific problem:

At last, we are ready to get specific. If you are tempted to start here, skipping all that goal setting stuff, you are not alone, but you will risk creating an extremely frustrated group. All the work will end up being done by one or two dedicated members who will not benefit from the ideas of the group. Or the work will not get done, or be of such poor quality that it can't be used.

Define one problem to work on. Define it in terms of need: we need .... Section II suggests each task. Either use those or develop your own.

6. Generating possible solutions:

Brainstorming is one of the more productive ways of doing this although there are other metaphorical or lateral thinking strategies which can be used. The group MUST review the rules of brainstorming before they begin, or ideas will be immediately attacked and the creative energies of the group will be hidden by the fear of being shot down.

Brainstorming rules: the purpose of brainstorming is to generate as many creative ideas a possible within a limited time. In order to brainstorm, the group needs a recorder whose responsibility is to write down all ideas without making comments (negative or positive) about their quality. (No member of the group should make negative responses.) It is important to encourage the flaky and foolish ideas since they often trigger the most realistic/creative approaches. If evaluative comments are made, it is the recorder's responsibility to remind the group just to keep ideas flowing, comments can be made later. Notes should be legible, but quick. This is not the time for calligraphy. Pace should be fast, energy level high and time limit short (5 to 10 minutes).

The second step of brainstorming is to take the list (or lists) and cluster the ideas in categories, remove duplicates, combine similar ones and remove or to a "debatable" list those which members of the group can not accept (see Consensus, below). The list then has to be typed or re-written before the next step.

7. Evaluating and testing solutions:

Evaluating a solution should be phrased in terms of "If we did (a), the result might be..." rather than "That is a terrible idea!" The advantage of the first approach (besides good manners) is that the discussion can focus on possible outcomes as the reason for accepting or rejecting the idea. The problem is, of course, the accuracy of the results predicted. The group can only make its best guess.

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8. Deciding on the best solution:

Vote vs. consensus. Those of us who have toiled long and hard in the field of consensus decision making understand why others take the faster approach and just count hands. We also know that, in the long run, consensus will get a group farther with less pain.

The purpose of consensus decision making is to place all group members in a position to say "I may not completely agree, but I can live with decision and support it." The alternative to consensus is majority vote where those who win are happy with the decision and those who lose are not and, more importantly, may not support the group's actions.

When all goes well and consensus is reached easily, the facilitator should check to make sure that all members are, in fact, content. Easy agreement may mean that participants don't really understand their responsibility to speak up, or don't believe that the process will really work.

When there is some conflict, but consensus is reached, the system seems wonderful. Usually there has been careful discussion, even more careful listening, some open disagreement and often "I messages." It is very exciting to think that the group has been able to respect everyone's feelings.

And then there are the times when consensus doesn't work. If some people feel group pressure to "go along so that we can do something", then the system has broken down and the group is back to majority rule. At these very discouraging moments, it usually pays to go back to setting the goal (first step) and look at where the group has gone and what went wrong. Chances are that the goal has changed, or the definition of the problem has changed. This doesn't mean starting all over again, but it does mean taking time to re-establish the purpose and assumptions of the group.

When consensus isn't being reached, it may be wise to stop, not in discouragement, but in realistic appraisal that the group's energy is low. Take a walk, exercise, eat healthy food (sugar is not the solution to getting a group functioning well), and relax. With a re-energized group, make a new attempt to define the problem, the alternatives and the solutions. Hopefully, a new idea will appear to free the group. On some issues, the group may never reach consensus. It is much better to recognize and live with that fact than to pretend that an agreement has been reached and build then rest of your structure on sand.

8. Settling details of implementation.

The first and last minutes of any meeting are the most important. That is a terrible burden on the facilitator and members, but it is true. Better to have a one hour meeting where everyone

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arrives on time and leaves together than a two hour one with a floating membership.

It is important to review (or agree to if it hasn't already been discussed) who will do what by when. (The note taking form makes it easy to record this information.) The group should make sure that tasks are shared realistically. Some people will take on too much and either burn out or not be able to finish; some will do less than their share. There are some tasks that can be done by support personnel not serving on the committee: typing up goals and objectives for the next meeting, distributing minutes. Someone has to be responsible for supervising that task so that it is done correctly.

Setting meeting dates. If possible set regular meetings very early and live with them. More meeting time is spent finding common meeting times than on anything else. Even with regular dates, it is important to remind people and to give sub-committees time to set meeting times. Make sure that ALL members of the committee ALWAYS bring their calendars. If necessary, put a reminder on each agenda until this becomes habit. Our experience is that administrators carry personal calendars, but teachers, whose time is already scheduled, tend not to. Everyone on the committee must carry a calendar. Life is too short to spend it chasing people to find meeting times!

The problem solving process is never-ending. Once one task is taken on, planned and accomplished, it is time for the next one. It is important that someone in the group act as historian, keeping a full record of all meetings and all decisions. As the group's task draws to a close, it is vital that the group review their original goals, their diagnosis of the forces, their hopes and their plans. Both the accomplishments (predicted and unpredicted) and the goals not yet reached will help the group understand how much they have accomplished, what they might have forseen or done differently, how they might work differently as members of other groups.

Author's note: The original manual from which most of the ideas in this section were taken was written when I had only limited experience in Logo and BASIC. I have avoided using computerese to draw the parallels between the generalized problem-solving process and computer-based problem solving. There were moments when terms had to be beaten back: "loop" in the previous paragraph, or "mind sized pieces" for defining specific problems, or "if statements" in consensus decision making. The potential for transferring the clarifying of the thinking process as stimulated by the computer and the developing of thinking processes in general remains one of the most intriguing aspects of computer education.

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MEETING PLANNING FORM
page one

PURPOSES OF MEETING	WHO SHOULD ATTEND	LONG RANGE GOALS FOR GROUP
1. 2. 3.		1. 2. 3.

	PERSON RESPONSIBLE	MECHANICS	DEADLINE	PURPOSE #	GOAL #
DATE Day of week: Month/Day/Year:					
PLACE Building: Room: Permission form:					
PREPARATIONS (Invitations, agendas, materials, special guests, etc.)					
FACILITATION					
NOTE TAKING					
EVALUATION					
FOLLOW-UP					

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MEETING PLANNING FORM
page two

AGENDA -items	PROCEDURE	ESTIMATED TIME	PRE-MEETING MATERIALS	MEETING MATERIALS	EQUIPMENT	PERSON RESPONSIBLE	PURPOSE #	GOAL #

Comments in planning process: problems solved, not solved:

Names of people involved in planning:

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Diagnosis of the Problem

Forces restraining the goal from being attained				Forces driving towards the goal		
-3	-2	-1	Force	+1	+2	+3

1) _____

2) _____

3) _____

4) _____

5) _____

6) _____

7) _____

8) _____

9) _____

Force Field Analysis Page Two

MEETING EVALUATION

Group.....Date.....

What was the most helpful part of this meeting?

What was the least helpful part of this meeting?

What changes in planning, physical arrangements, or activities should be made before the next meeting?

Other suggestions or concerns?

Chart developed by Ken Blanchard

Goals	Pessimistic	Realistic	Optimistic	Comments

NOTE TAKING FORM

Minutes for:	Date:	Time: ____to____	Place:
Present:			Page ____ of ____

Item	Action	Responsible	Deadline

APPENDIX B

TEACHER TRAINING

Pre-requisite Skills

Intermediate Workshops

TEACHER TRAINING

(The first part of this section is an excerpt from an article submitted to The Pointer by Ann Egan and Mary Alice Wilson.)

Pre-requisite skills for the teacher:

There is a dangerous mythology about how easy it is to use a microcomputer. This myth is certainly encouraged by the computer manufacturers who want people to purchase hardware not training time. Microcomputers are SO easy... The mythology appears in different forms:

a. On a recent panel, a local University professor argued that extensive training on the computer wasn't necessary. "Why my wife uses the microcomputer as a word processor and doesn't know anything about computers. Of course, if she gets into any kind of trouble, she has to wait until I come home." Anyone using a word processing program, indeed any computer program, is going to "get into trouble". A teacher does not want to be embarrassed, lose student work, or ruin a disk or computer; a teacher wants to be competent. Competence requires training time.

b. There are also those who argue that the teachers don't need training, "Just let your students teach you." Although it is certainly true that many students know more about programming microcomputers than their teachers will ever know, the teacher is still responsible for the control of the learning environment. There may come a time when teachers and students will be so familiar with the use of the microcomputer that no training of teachers and no supervision of students is necessary. We are not at that stage in Massachusetts.

c. Another argument states that it is only necessary to learn about the common Applications Programs (like word processing); no one needs to learn any programming. It is silly to learn simple programming if you are not going to learn complex programming and be a programmer. In order to make effective use of the microcomputer for ANY TASK, a teacher needs to have a fundamental understanding of how to manipulate information on a microcomputer, i.e. how to load, use, store, copy and erase files; how to read jargon-laden manuals; how to print out files; how to treat equipment and software safely; and how to help students do the same. These skills are much more easily learned in a few lessons of Logo and BASIC than they when learning to use a word processing program, or any other applications program. The access to the commands is much cleaner; the reason much easier to understand.

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d. Finally, we often are told, "We offered a course before the computers arrived, the teachers know all about these machines. They don't need any more training." Most of us are not very good learners if we don't believe we will ever have a chance to use the skills. Many teachers who sit through lectures of microcomputers don't think they will ever actually have one. Even if they were paying attention and taking good notes, learning to use the microcomputer is a physical act. Could we learn to drive a car if we never got behind the wheel? Computers take time to learn. The computer has to be available for hours and hours of practice.

Of course, teachers can learn to manipulate a computer by themselves. However, if teachers choose to participate in an inservice course in microcomputers, they need a minimum of five 2 1/2-hour sessions in a lab-based course before they feel any comfort with the machine. Although the Collaborative offers a variety of courses at our Resource Center and in the schools, we have found that the most effective introduction includes:

session 1: Logo (turtle graphics, simple procedures)
session 2: Word processing (focus on one program, comparing programs)
session 3: introduction to BASIC (line numbers, string and numeric variables, branching)
session 4: electronic spreadsheets
session 5: database management

Software evaluation, an important component of the introductory course, is either added as session 6, or is built into each session.

Intermediate Workshops:

After the teacher has a general background in the safe operation of computers and learned a variety of applications for the computer, it is time to concentrate on specific uses. A number of series can be helpful:

1. Using Word Processing in the classroom If this includes making sure that teachers understand the commands and their usefulness, it will take 2 sessions with practice time between. If teachers also want to explore the application of word processing to the pre-writing, writing and revising, one more session should be included.

2. Logo All the graphics commands and the use of Levels of Procedures, Simple Recursions, Saving, Reading and Printing can be learned in 3 sessions. Advanced work with list processing and recursion can be scheduled in 4-sessions units.

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3. BASIC Most of the common commands including arrays and files can be introduced in 8 sessions. More advanced application should be scheduled in 4-session blocks.

4. Database management Most of the database programs take 3 sessions. It is important to train teachers on the database they will use since the commands, and the logic, vary more in databases than in any other general application area. (Databases are a wonderful teaching tool to help students design and work with information.)

5. Spreadsheets To set-up and learn to manipulate information on an electronic spreadsheet uses 2 sessions. Learning to transfer that information to other programs for plotting or statistical analysis would take another session. (Spreadsheets are also an excellent instructional simulation tool.)

6. Software evaluation There is such a variety of software that the process of reviewing could be endless. However, three sessions would give teachers an opportunity to review a wide variety of different types of software and to review some of the longer programs.

7. Graphics Although Logo and BASIC have important graphics components, there are many additional graphics programs which use drawing tablets and graphic generation programs. One session would be necessary for each program.

8. Music Dramatic changes are occurring in the inexpensive musical capabilities of the microcomputers and the accessibility of those capabilities to the programmer. We have never taught courses in this area so estimating number of sessions would be a pure guess (4?)

9. Subject specific uses For example integrating computers into advanced math courses, business education, or Social Studies. The review of the concepts and the specificity of the applications has taken most of a semester in the schools where it has been tried. This is also an area where teachers from the same discipline but from different school systems can benefit by working together.

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